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# THE DISCRIMINATION OF ARTICULATE SOUNDS BY CATS

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This paper is a report of experiments which were made with cats to determine their ability to discriminate articulate sounds. If an animal forms an association between a certain name and food, so that he reacts in a definite manner to that name in order to obtain food, and does not so react when other names are called, we may say he discriminates that name from the other words. The major part of the routine work of the experiments to be reported was done by my wife, Mrs. Barbara Shepherd.

It is commonly believed that the higher mammals can be taught to respond to their names, or to express it more accurately, to discriminate articulate sounds and to make appropriate motor responses thereto. It is well known that dogs, horses and other domesticated animals learn to respond to their given names; but it is not known, from well-conducted experiments, whether there is in these cases a discrimination of quality, loudness, or of time of the sound. The results that have been obtained with animals under experimental conditions have been few, and in some cases the differentiation of tone and intensity has not been made. Thorndike, it will be remembered, found that cats were apparently able to discriminate sounds made by him, though not with a great degree of delicacy.<sup>1</sup> The sounds that Thorndike used were quite complex in character, such as, "I must feed those cats" and "My name is Thorndike." In his work on the functions of the temporal lobes Kalisher reported<sup>2</sup> having been able to get dogs to discriminate sounds made by an harmonium, but he was more interested in producing the association for the purpose of determining (after extirpation of different parts of the cerebral cortex) the cortical centers for sound perception than ability in his animals to discriminate sounds. Selionyi,<sup>3</sup> using a form of the 'Pawlow method' on dogs, has also obtained evidence of discrimination by them of the tones of an organ, of organ pipes and of two whistles. He also was chiefly interested in sound discrimination from a physiological standpoint. In experiments on auditory discrimination in raccoons by the present writer in 1906, reported by Cole,<sup>4</sup> evidence of pitch discrimination by those animals was obtained. In experiments on auditory discrimination in Rhesus monkeys which I made in 1909, evidence of discrimination of pitch and also of discrimination of 'noise' was obtained.<sup>5</sup> In tests made by the present writer on raccoons for the discrimination of articulate sounds,<sup>6</sup> similar

<sup>1</sup> THORNDIKE, *Animal Intelligence*, 1898, 129 ff.

<sup>2</sup> KALISHER, *Eine neue Hörprüfungsmethode bei Hunden*, *Sitz. d. Kgl. Ak. d. Wiss.* X. 1907, 204 ff.

<sup>3</sup> SELIONYI, G. P., *Contributions to the Study of the Reactions of the Dog to Auditory Stimuli*. St. Petersburg, 1907.

<sup>4</sup> COLE, *Concerning the Intelligence of Raccoons*, *Jour. Comp. Neur. and Psychol.* XVII. 236.

<sup>5</sup> SHEPHERD, *Some Mental Processes of the Rhesus Monkey*, *Psychol. Rev. Mon. Sup.* No. 52, 1910, 26 ff.

<sup>6</sup> SHEPHERD, *The Discrimination of Articulate Sounds by Raccoons*, *Amer. Jour. Psychol.* XXII, 1911, 116 ff.

to the tests herein presented, satisfactory evidence of such discrimination was obtained.

At the time the experiments to be reported were begun, one of the animals was seven months old. It had not been called by any especial name, and had not had any previous training in the discrimination of articulate sounds. The animal appeared to be of medium intelligence. The other cat, the mother of the first, was about three years old. The latter animal, previously to these experiments, had been given the name of Widget, and apparently responded to that name. The cat was of average intelligence. Both animals were ordinary grey house cats.

The cat was placed in a cage, 66 centimeters in height. A wire netting formed the front and also the top of the cage. The experimenter sat a distance of about a meter from the front of the cage and called the name given the animal. Ten seconds were allowed the cat, if necessary, in which to give the proper motor response, then, whether or not a response was obtained, the animal was fed. In conjunction with the name given, other words were also called, viz., 'no feed,' and when the latter words were called the cat was not fed. For the first animal the proper response was considered to be obtained if it reared up with the paws on the front of the cage and looked up for food to be given it through the top of the cage. A similar response was required of the second cat in the earlier experiments with it, while in the later ones the required response was changed, as will be hereinafter explained. The name of the animal and 'no feed' were called in an irregular order, so that the response might not be to the mere of the calling of the words. During the experiments, the cats were kept moderately hungry.

*Pet.* On the third day of the experiments, this animal began to show some indication of forming the association: In twenty trials it responded to the name *Pet* nine times, and in twenty trials to the 'no feed' call, it responded three times. The animal continued to improve in the association of its name with the proper reaction, and, on the ninth day, or after 150 trials in all, of 'Pet' and of 'no feed,' it responded to the name 'Pet' nineteen times in twenty trials, and to 'no feed' seven times. On the thirteenth day, or after 250 trials, the cat had perfected the association. In twenty trials it responded to its name twenty times and to 'no feed' two times. In one of its responses to 'no feed' on that day, the cat got down again at once. In four of the trials it got part way up. In both of the latter instances of errors, it appeared, by its looks, to know that it had made a mistake by so responding. Control tests were then made of the animal's ability to discriminate. In the first of these control tests other words were substituted for 'no feed,' as 'box,' 'floor,' but no difference in ability properly to react was noted. As a second control test, the words were called in varying tones of voice, in quite loud tones and in very low tones; but the percentage of proper reactions remained as in the experiments proper. As a third test, the words were called by a different person. Again the responses were strikingly characteristic of discrimination.

*Mary.* The older animal showed no clear indications of forming the proper association until about the tenth day of the experiments with it. On that day it responded to 'Mary' ten times and to 'no feed' six times in twenty trials. After this its progress in forming the association was slow. So slow did it appear in this regard that we attributed its slowness to the rather marked inactivity of the older animal. We

had noticed, however, that when its name was called the cat would look up at the top of the box or at the food lying at the distance of about a meter from the front of the cage. From this hint we changed the response required of this animal to constitute evidence of discrimination. We counted it sufficient indication of such discrimination if the animal looked towards the food when its name was called. Mary's improvement in properly reacting was at once marked. On the second day thereafter in twenty trials the cat gave the appropriate response fifteen times and reacted to the 'no feed' call six times. On the twenty-fifth day's experiment with this animal, it responded to the name Mary nineteen times and to 'no feed' four times. In nine days' further experiments this cat's record continued nearly similar to the twenty-fifth day's trials. The animal never entirely succeeded in inhibiting the tendency to respond to the 'no feed' signal. Similar control tests were employed as had been used in the case of the other animal. The results were approximately the same in percentages of proper reactions as in the experiments proper.

The results of these experiments are clearly positive. It does not appear possible to attribute the reactions of the cats to any other mental process than association of the names given them with the food getting, and the consequent discrimination of the names given them from the other words used. It cannot be objected that the animals received any cue from the experimenter, as we were careful to remain impassive during the trials, and not to give by looks, motions of the hands or body, any cue to the required response, or to allow any perceptible difference of attitude to be exhibited by us when the names Pet and Mary were called and when the other words were articulated. Neither can it be urged that the cats were led by the smell of the food to react to their names. The food was in exactly the same position in relation to the animals when their names were called as it was when we called the other words. Moreover, the three control tests employed in the experiments appear sufficiently to confirm the claim that the discrimination did take place. We conclude, therefore, that cats, or at least some cats, are able to discriminate articulate sounds.

It is of some interest to note that while in these experiments the younger cat formed the association in 250 trials, the older animal required 490 trials to form a similar association. Now, while from the small number of individuals tested in these experiments, we may not infer that younger cats will always, or usually, form an association more quickly than do their older congeners, the above results serve as confirmatory of the view held by many observers in this field that the younger, more active individuals, learn to form certain associations with more facility than do older animals under similar conditions.<sup>7</sup> As compared to the ability of raccoons to discriminate words, as shown by results in similar experiments, the results obtained from the cats in these experiments appear roughly to correspond in rapidity of learning. While four raccoons tested took respectively 270, 375, 425 and 500 trials to perfect the association, the cats respectively took 250 and 490 trials. Here again, because of the few individuals used in these experiments, we are not warranted in drawing a safe inference as to the comparative ability of cats and of raccoons to discriminate words.

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<sup>7</sup> The fact that the older animal responded (apparently) to a different name before these experiments began might be a factor which would account in some degree for the different rapidity with which the two cats learned their names in these experiments.